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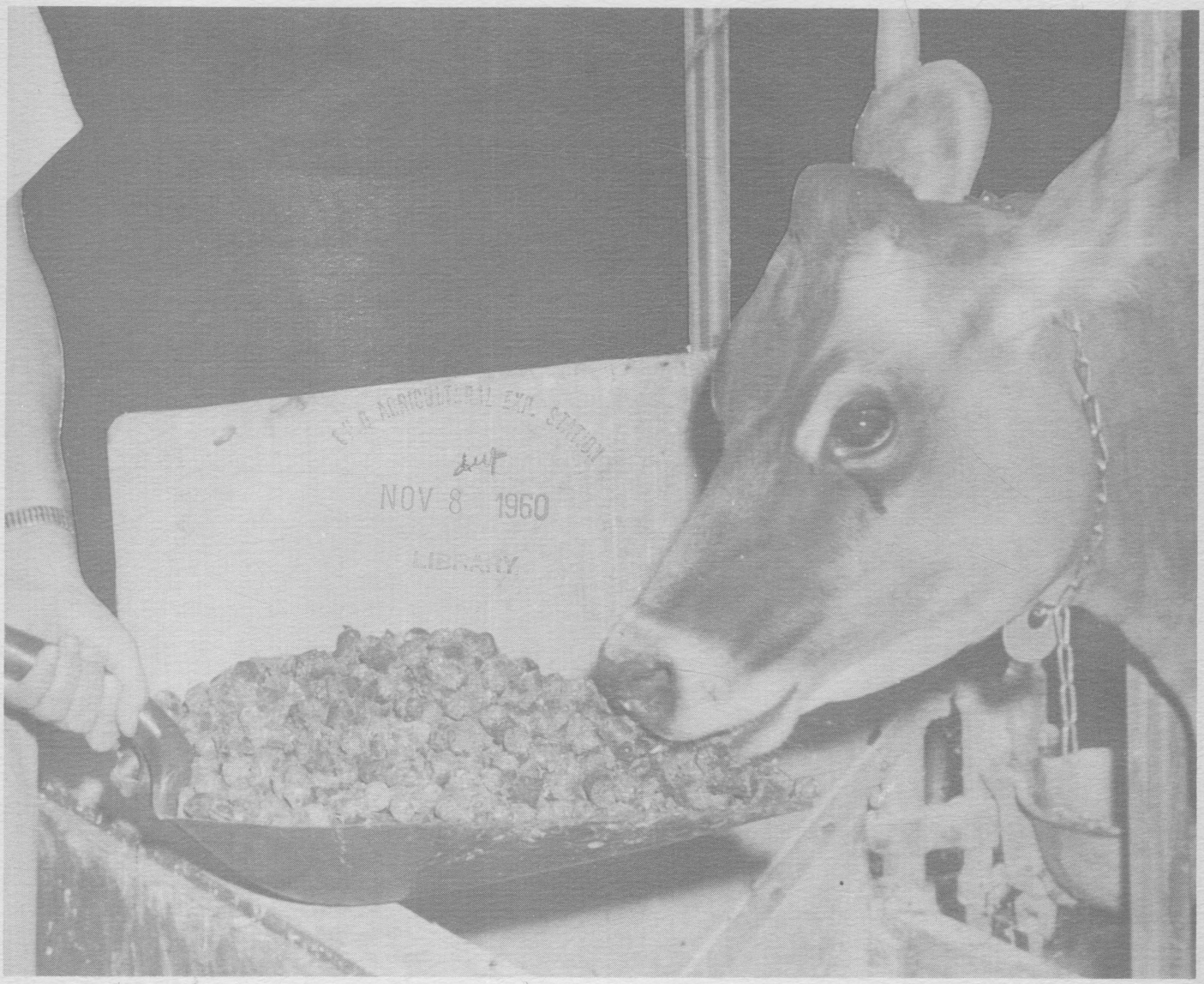

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UTILIZATION OF FIELD-CHOPPED, DEHYDRATED, PELLETED ALFALFA BY MILKING COWS

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INTRODUCTION

Considerable interest has developed in the possibilities of pelleting forage crops as a means of overcoming nutrient losses, standardizing the quality and physical characteristics of forage for animal feed, reducing labor in harvesting and feeding and reducing storage space.

Results of published data show that pellets made from finely ground hay and fed as the only roughage are unsatisfactory for dairy cows because of decreased butterfat percentage in the milk and marked reductions in cellulose digestibility (6). However, it is not established how fine pelleted hay can be ground without depressing digestibility and butterfat percentage. The following experiment was carried out to obtain information on the value of pelleted, dehydrated, field-chopped hay as the only forage for milking cows.

EXPERIMENTAL PROCEDURES AND RESULTS

The experimental roughages used were third and fourth cutting, field-chopped alfalfa dehydrated in an oil-fueled rotating dehydrator and pelleted through a three-fourth inch cylindrical die without further grinding. Daily milk production, weight changes, and feed intake were measured and percent butterfat and digestibility determined in two experiments with lactating cows.

Experiment 1

In this experiment the performance of cows being fed free choice freshly cut field-chopped alfalfa daily was compared with

their performance after changing to pelleted alfalfa. The chief purpose was to obtain preliminary information on the feeding value of the pelleted alfalfa.

Six Jersey and two Holstein cows in late lactation were shifted during a 2-week period to alfalfa pellets as the sole roughage. At this point the cows commenced eating considerable amounts of the wood shavings being used for bedding. The daily intake of pelleted alfalfa by individual cows was highly variable. One aged cow refused to eat more than 5 pounds of alfalfa pellets and was replaced in the experiment with a younger cow. It was presumed that these problems resulted from development of abnormal physical conditions in the rumen or lower digestive tract. It was found that feeding 3 to 5 pounds of mixed clover hay daily eliminated these difficulties.

The experiment was continued with Jerseys receiving 3 pounds and Holsteins 4 pounds of mixed clover hay daily in addition to free choice alfalfa pellets. A grain mixture containing approximately 12.5 percent protein was fed at the rate of 25 percent of the total roughage intake. This approximated the rate of grain feeding used with the freshly cut alfalfa. The alfalfa forages although judged to be comparable differed in some respects. The green alfalfa was freshly cut morning and evening throughout the period from September 5 to 19. The pelleted alfalfa was harvested on September 20 from Denmandale Farm in Trumbull County.

Free choice pellet feeding was continued for an 8-week period. Results for the last six weeks of the feeding period are summarized in Table 1. The changes in butterfat percent are

shown in Table 2. Digestion trials and nitrogen balances were carried out during the eighth week of the pellet feeding experiment. They were compared with results of similar trials using the freshly cut alfalfa during the period of September 12 to 19 (Table 1). Rumen samples were obtained by stomach tube for microbiological observations. The cows were placed on rubber mats and two cows were shifted to a sole roughage ration of pellets after 6 weeks for digestion trials. The results obtained with these cows are shown in Table 3.

Experiment 2

The purpose of this experiment was to obtain further information on higher producing cows fed pelleted alfalfa. Four Holstein cows approaching the end of the first month of lactation were gradually shifted to pelleted, fourth cutting alfalfa with no molasses added and daily milk production was compared during an 8-week period with the production of four cows with similar producing ability, Fig. 1. The alfalfa pellets were fed free choice with 4 to 8 pounds of mixed clover-timothy hay daily. Grain was fed at the approximate rate of 25 percent of the total roughage intake. The control cows were fed second cutting alfalfa and corn silage supplemented with a maximum of 14 pounds of grain per day. The grain mixture for the control cows contained 15.9 percent total protein.

Four digestion trials carried out with two other cows showed that the dry matter digestibility of the total ration including alfalfa pellets, hay and grain was 66.6 percent compared to 67.8 percent for the corn silage, hay and grain ration.

DISCUSSION OF RESULTS

The results of these experiments showed that the pelleted alfalfa made from field chopped dehydrated forage was highly acceptable to cows provided 3 to 5 pounds of hay were included in the daily ration. Milk production was as high as that obtained on the control ration and butterfat percentages were not significantly changed although they did average 0.2 percent units lower. Thus it is concluded that optimum milk yields may be obtained with the coarsely chopped pelleted alfalfa.

From the nutritional standpoint, digestibility was reduced. Cellulose digestibility dropped to 41.3 percent compared to 67.5 percent for the control ration. However, daily feed intake rose to relatively high levels and compensated for the reduced digestibility. As a result the average daily digested dry matter intake was essentially the same with the pelleted forage and contaol rations.

The principal problems in feeding pelleted forage have arisen from fine grinding. The observed physiological effects of fine grinding have been more rapid passage from the rumen, reduced digestibility, decreased formation of acetic acid in the rumen, and lowered butterfat percentage in the milk (2, 3, 4, 5, 8 and 9). The results of our experiments show that pelleting alfalfa forage into a three-fourth inch pellet resulted in hay particles which were too fine for maximum cellulose digestion before passage from the rumen. It is apparent that a forage pellet consisting of coarser materials than the three-fourth inch field chopped pelleted alfalfa is necessary for optimum digestibility. In this regard, Bringe et al. have already shown that hay pellets

made from long-cut hay were equally as digestible as similar hay in the unpelleted form (1).

No significant changes were observed in the type of flora maintained in rumens previous to and after initiating pellet (3/4 inch) feeding. This finding suggests that the reduction in cellulose digestibility stemmed more from too rapid passage from the rumen than from a shift in the type of fermentation in the rumen.

SUMMARY

In two experiments with milking cows third and fourth cutting alfalfa which had been field chopped, dehydrated and pelleted directly through a three-fourth inch cylindrical die was compared with third cutting field chopped alfalfa fed green and with a corn silage alfalfa hay ration. Milk yield was essentially the same for the pellet-fed cows as for their controls. Dry matter, protein, and cellulose digestibility averaged 11, 14 and 26 percentage units lower, respectively.

It was found necessary to feed 3 to 5 pounds of long hay daily to cows fed pellets free choice in order to maintain optimum feed consumption.

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TABLE 1

Comparison of pelleted third cutting field-chopped alfalfa with field chopped green-fed alfalfa for milk production, feed intake and digestibility in dairy cows with grain intake maintained at approximately 25% of the dry feed.

	Green alfalfa 1/	Pelleted alfalfa 2/
No. of animals	8	8
Date of feeding trial	Sept. 5-19	Oct. 5 - Nov. 17
Milk production (adjusted), (lb./d.) 3/	31.7	31.4 3/
Milk production (actual), (lb.)	31.7	25.6
Feed intake, (lb./d.)		
Jerseys (6)	25.6	29.8
Holsteins (2)	35.9	39.5
Dry matter digested, (%)	71.2	60.6
Cellulose digested, (%)	67.5	41.3
Protein digested, (%)	76.1	65.0
Digested dry matter intake, (lb./d.)		
Jerseys (6)	18.2	18.1
Holsteins (2)	25.6	23.4
Body weight gain, (lb./d.)	0.1	0.7
Rumen microorganisms 4/		
Hay I		
a. Large G+ coccoids	2.3	3.6
Hay II		
a. Large G+ square-ended rods	1.5	1.4
b. Very large G- cigar-shaped rods	0.0	0.0
c. G- short rods in groups of fours and its multiples	3.8	1.2

1/ Harvested from OAES pasture plots. Field chopped and fed green for A.M. and P.M. feedings.

2/ Harvested from Denmandale Farms, dehydrated, passed through a hammer mill without screen and pelleted with a 3/4 inch die.

3/ Adjusted for time in lactation to compare with the time when green alfalfa was fed using regression of milk production on time through the 4 months previous feeding period (b equalled 0.11 lb./day).

4/ Each microorganism rated 0-4. See reference seven (7) for procedure used in rating microorganisms.

TABLE 2

Average per cent butterfat in milk of 8 cows before and during alfalfa pellet feeding.

Roughage fed	Date	No. of Cows	Butterfat (%)
Fresh alfalfa, chopped	8-18-58	8	4.83
Fresh alfalfa, chopped	9-8-58	8	4.79
Changing over	9-22-58	8	4.62
Alfalfa pellets + 3 lb. of hay	10-6-58	8	4.29
Alfalfa pellets + 3 lb. of hay	10-20-58	8	4.68
Alfalfa pellets + 3 lb. of hay	11-3-58	8	4.80

TABLE 3

Utilization of alfalfa pellets by Jersey cows with and without 3 lb. of clover hay.

	Alfalfa pellets	Alfalfa pellets + 3 lb. of hay
No. of cows	2	4
Milk production, (lb.)	23.8	23.3
Butterfat, (%)	4.90	4.92
Grain intake, (lb.)	8	8
Roughage intake, (lb.)	26.8	26.8
Dry matter digested, (%)	61.6	60.6

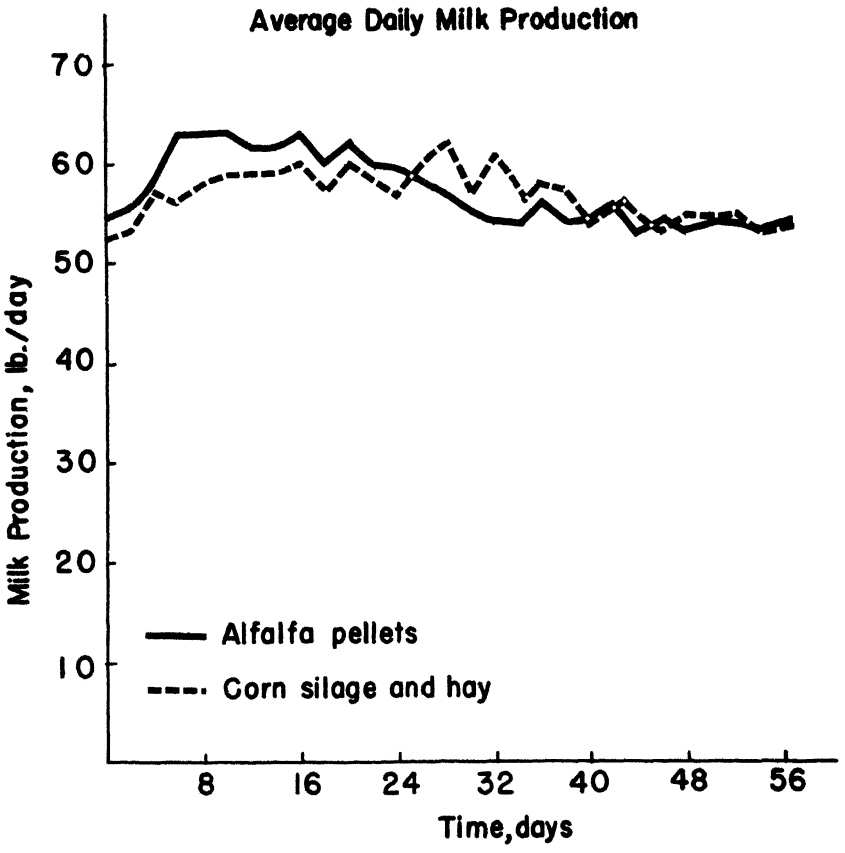

Fig. 1. Milk produced by Holstein cows fed alfalfa pellets free choice with 4 to 8 lb. of mixed clover hay daily compared to the production of a similar group fed corn silage and alfalfa hay.